Environment Canada

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Région de l'Ouest et du Nord

VEHICLE EMISSION TEST PROGRAM - BRANDON 1987

by

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Environmental Protection Service

Service de la protection de l'environnement

VEHICLE EMISSION TEST PROGRAM

BRANDON 1987

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ABSTRACT

A vehicle emission test clinic was held in June 1987 in Brandon, Manitoba, to gather information on emission levels of hydrocarbons and carbon monoxide from in-use motor vehicles. Inspections were also carried out to determine the extent of tampering with emission control systems. Emission levels were compared to Environment Canada's suggested exhaust emission test limits, and the effects of tampering on emission levels were assessed. Emissions from the majority of vehicles were found to be within the suggested limits. Tampering resulted in significantly higher concentrations of carbon monoxide and hydrocarbons in vehicle exhaust.

RESUME

Afin d'obtenir des données sur les échappements des hydrocarbures et du monoxyde de carbone qui proviennent des véhicules en service, Environnement Canada a effectué une analyse de véhicules en juin 1987. Un programme de vérification a aussi été mis sur pied afin de déterminer l'étendue des cas d'altération du dispositif antipollution. Les émissions par les gaz d'échappement ont été comparées aux normes recommendées par Environnement Canada, et les effets d'altération sur ces émissions ont été évalués. L'étude a démontré que les émissions provenant de la plupart des véhicules n'excédaient point les normes recommendées par Environnement Canada. Cependant, l'altération du dispositif antipollution avait comme résultat une augmentation importante des niveaux des hydrocarbures et du monoxyde de carbone dans les gaz d'échappement.

TABLE OF CONTENTS

	PAGE
ABSTRACT	ii
RESUME	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	v
1.0 INTRODUCTION	1
2.0 CLINIC LOCATION AND SET-UP	2
3.0 ADVERTISING AND MEDIA COVERAGE	3
4.0 TESTING PROCEDURES	3
5.0 SURVEY RESULTS	4
5.1 EMISSION LEVELS	4
5.2 TAMPERING	7
5.3 COMPARISON OF BRANDON RESULTS WITH OTHER SURVEYS	14
5.3.1 Tailpipe Emissions	14
5.3.2 Tampering	16
6.0 CONCLUSIONS	19
7.0 REFERENCES	21
8.0 ACKNOWLEDGEMENTS	22
APPENDIX A BRANDON SUN ARTICLE	23
APPENDIX B SURVEY FORM	25
APPENDIX C ENVIRONMENT CANADA SUGGESTED EMISSION TEST LIMITS	27

LIST OF TABLES

TABLE		PAGE
1	EMISSION LEVELS AT IDLE	5
2	EMISSION LEVELS AT 2500 RPM	6
3	EMISSION LEVELS BY MODEL YEAR	8
4	TAMPERING SURVEY RESULTS	10
5	TYPES AND FREQUENCY OF TAMPERING	11
6	COMPARISON OF TAILPIPE CONCENTRATIONS OF CO AND HC IN NON-TAMPERED, ARGUABLY TAMPERED AND TAMPERED VEHICLES 1975 - 1987 MODEL YEARS	13
7	COMPARISON OF MANITOBA TEST CLINIC RESULTS	15
8	COMPARISON OF TAMPERING RATES	17

VEHICLE EMISSION TEST PROGRAM

BRANDON 1987

1.0 Introduction

Vehicle emission test clinics have been held in various cities across Canada since the early 1970s to gather emission data and other information on in-use motor vehicles. In June 1987, Environment Canada conducted a five-day emission test clinic in Brandon, Manitoba, similar to one held in Winnipeg in June 1986. Brandon motorists were invited to bring their cars and light duty trucks for voluntary testing and inspections by Environment Canada and Manitoba Environment staff.

The purpose of the clinic was to gather information on emission levels of hydrocarbons (HC) and carbon monoxide (CO) from in-use motor vehicles, to identify the extent of tampering with pollution control devices, and to promote an awareness amongst motorists and the public-at-large of the importance of motor vehicles as a source of air pollution.

2.0 Clinic Location and Set-up

The Brandon test clinic was held at the Keystone Centre, which is the major exhibition centre for the area. The area is centrally located and offered an ideal site for traffic control and clinic set-up.

The lay-out and operation of the clinic were similar to that described in the Winnipeg test clinic report (Youmans, 1986). The hours of operation were 9 a.m. to 4:30 p.m., from Tuesday June 23 to Saturday June 27. As with the Winnipeg clinic, on-site security arrangements were made for the equipment and tent during off hours.

3.0 Advertising and Media Coverage

Newspaper advertisements for the event were placed in the Brandon Sun on three separate days, and 30-second radio advertisements were run several times a day on CKLQ radio. A press release was also sent out to local radio, TV and newspaper offices prior to the clinic.

A 1.5 x 3 metre mobile sign announcing the test clinic dates and hours was rented and placed at the entrance to the Keystone Centre for the duration of the clinic.

An opening event was held to enhance media coverage of the clinic. Local dignitaries from the City of Brandon and the Chamber of Commerce attended, but, although invited, the local media did not attend. The local TV station (CKY TV) and newspaper (Brandon Sun) did send reporters to the clinic later in the week to have vehicles tested and to interview staff. An article describing the clinic and its purpose appeared in the Brandon Sun on June 24 (Appendix A).

4.0 Testing Procedures

The test procedures followed were similar to those of the 1986 Winnipeg test clinic (Youmans, 1986). In addition, a check was made for the presence of lead in the tailpipe of selected vehicles, using Plumbtesmo[1] test paper. The test paper will detect small quantities of lead on the inside of tailpipes, and was used to confirm motorists' statements about the type of fuel they were using, and to detect misfuelled vehicles.

Certain models of Ford vehicles had under-hood labels indicating that specific emission test procedures were to be followed with these vehicles. This involved turning off the ignition and restarting the vehicle immediately prior to testing, and taking tailpipe readings within certain time periods to avoid er-

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[1] Registered trade mark of Machery-Nagel, Duren, W. Germany

roneously high readings. This procedure was followed where appropriate.

The 1986 survey form was revised in 1987 so that all the information could be recorded on one page instead of two. A copy of the survey form is contained in Appendix B.

5.0 Survey Results

5.1 Emission Levels

In total, 247 vehicles were inspected over the five day period, and 244 were tested for tailpipe emissions. Those not tested included one diesel and two other vehicles that were obvious oil-burners. As shown in Table 1, 73% of the vehicles had idle carbon monoxide (CO) emissions below Environment Canada's suggested emission test limits for the appropriate model year. Suggested hydrocarbon (HC) limits were met by 84% of the vehicles tested. The suggested limits were the same as those used in 1986, and are contained in Appendix C.

At 2500 rpm, emissions from 88% of the vehicles were below the CO limit value, while 95% had emissions below the hydrocarbon value (Table 2). Emissions at 2500 rpm are typically lower than at idle because of the more optimum air/fuel ratio provided in

TABLE 1

EMISSION LEVELS AT IDLE

Model Year	Number of Vehicles with: Carbon Monoxide Levels: Less Than Limit*	1-2x Limit	2-3x Limit	>3x Limit	Hydrocarbon Levels: Less Than Limit	1-2x Limit	2-3x Limit	>3x Limit
1987	9	-	-	-	9	-	-	-
1986	22	-	-	-	19	1	2	-
1985	33	1	2	-	30	5	1	-
1984	23	1	-	-	23	-	-	1
1983	16	5	2	1	20	4	-	-
1982	17	2	4	-	19	3	-	1
1981	12	3	4	1	16	3	-	1
1980	16	2	4	-	15	5	2	-
1979	7	4	1	-	11	1	-	-
1978	4	4	3	-	9	2	-	-
1977	5	4	2	-	7	3	1	-
1976	8	2	-	-	9	1	-	-
1975	1	4	-	-	5	-	-	-
1974	-	1	-	-	1	-	-	-
1973 & older	6	6	2	-	12	2	-	-
TOTAL	179	39	24	2 (244)	205	30	6	3 (244)
% of TOTAL	73.4	16.0	9.8	0.8	84.0	12.3	2.5	1.2

* Refers to Environment Canada Suggested Emission Test Limit (Appendix C).

TABLE 2

EMISSION LEVELS AT 2500 RPM

Model Year	Number of Vehicles with: Carbon Monoxide Levels: Less Than Limit*	1-2x Limit	2-3x Limit	>3x Limit	Hydrocarbon Levels: Less Than Limit	1-2x Limit	2-3x Limit	>3x Limit
1987	8	1	-	-	9	-	-	-
1986	19	1	2	-	21	1	-	-
1985	35	1	-	-	30	5	1	-
1984	21	3	-	-	23	1	-	-
1983	20	4	-	-	24	-	-	-
1982	18	3	2	-	23	-	-	-
1981	17	1	2	-	20	-	-	-
1980	18	3	1	-	22	-	-	-
1979	12	-	-	-	12	-	-	-
1978	11	-	-	-	11	-	-	-
1977	9	-	1	1	10	1	-	-
1976	10	-	-	-	10	-	-	-
1975	4	-	1	-	4	1	-	-
1974	1	-	-	-	1	-	-	-
1973 & older	12	2	-	-	11	2	1	-
TOTAL	215	19	9	1 (244)	231	11	2	0 (244)
% of TOTAL	88.1	7.8	3.7	0.4	94.7	4.5	0.8	0

* Refers to Environment Canada Suggested Emission Test Limit (Appendix C).

the off-idle position.

The data in Table 3 show emission levels by model year. The small spread between idle and 2500 rpm CO and HC values in newer vehicles is likely due to the fact that many of the new vehicles are equipped with fuel injection, computerized controls and, in general, more sophisticated emission control systems than the older vehicles. The values in Table 3 also indicate that considerable variability in emissions existed from one model year to the next. This is due in some cases to the small sample size, although maintenance history, mileage and other factors also influence emission characteristics significantly.

5.2 Tampering

The types and frequency of tampering with emission control systems were investigated as part of the survey. Tampering can result in significant increases in CO, HC and nitrogen oxide (NOx) emissions. For example, removal of a catalytic converter can result in a four to five-fold increase in emissions.

Tampering with one component or system can also have an impact on the operation of other systems, and can have a negative impact on vehicle performance. For example, if the oxygen sensor, common on newer vehicles, is contaminated with lead through misfuelling, the computer which regulates the air/fuel mixture

TABLE 3

EMISSION LEVELS BY MODEL YEAR

Model Year	No. of Vehicles Tested	Ave. CO (%)		Ave. HC (ppm)	
		Idle	2500 RPM	Idle	2500 RPM
1987	9	0.37	0.31	89	61
1986	22	0.28	0.54	152	82
1985	36	0.52	0.38	158	66
1984	24	0.42	0.59	155	95
1983	24	1.62	0.75	218	97
1982	23	1.40	0.98	239	102
1981	20	2.15	0.70	308	108
1980	22	1.79	0.96	391	118
1979	12	4.59	0.31	279	91
1978	11	2.79	0.59	335	138
1977	11	2.63	1.85	505	297
1976	10	1.90	0.53	326	179
1975	5	3.28	1.61	208	158
1974	1	4.60	2.00	190	170
1973 & older	14	2.75	1.06	272	363
TOTAL	244	-	-	-	-
AVERAGE	-	1.58%	0.73%	246 ppm	124 ppm

will receive and transmit faulty readings, resulting in poor driveability and fuel economy. Lead contamination as a result of misfuelling will also impair the operation of the catalytic converter.

The data obtained from the tampering inspections of 247 vehicles are shown in Tables 4 and 5. The results were divided into two categories: arguably tampered and tampered. "Arguable tampering" consists of tampering which may or may not alter the emission characteristics of a vehicle, such as removal of carburetor seals, adjustment of the carburetor idle mixture setting, removal of the "unleaded fuel only" label or disconnection of the heated air intake. The disconnection, removal or failure to maintain certain components or systems such as the catalytic converter, exhaust gas recirculation (EGR) valve, or air injection system, however, are known to increase a vehicle's emissions significantly, and were considered as "tampering". This division has been made by the U.S. EPA in its tampering surveys (U.S. EPA, 1986).

Generally, the tampering rate was found to increase with vehicle age (Table 4), but there was considerable variability noted from one model year to the next. Overall, the rate of "arguable tampering" was higher than for "tampering" and, in the majority of cases, involved the removal of the sealed plugs or limiter caps on the carburetor idle mixture screws (Table 5).

TABLE 4

TAMPERING SURVEY RESULTS

Model Year	No. of Veh. Inspected	Number Arguably Tampered With	%	Number Tampered With	%
1987	9	1	11	0	0
1986	23	2	9	0	0
1985	36	4	11	1	3
1984	24	2	8	1	4
1983	24	11	46	0	0
1982	23	3	13	5	22
1981	20	11	55	3	15
1980	22	7	32	8	36
1979	12	4	33	6	50
1978	11	5	45	6	55
1977	11	4	36	7	64
1976	10	4	40	4	40
1975	5	4	80	1	20
1974	1	1	100	0	0
1973 & older	16	8	50	0	0
TOTAL	247*	71	-	42	-
AVERAGE	-	-	29%	-	17%

* Includes 3 vehicles not tested for emission levels.

TABLE 5

TYPES AND FREQUENCY OF TAMPERING

Pollution Control System	No. of Vehicles Equipped	No. of Disconnections or Malfunctions	%
ARGUABLE TAMPERING			
Carburetor Idle Limiters/Sealed Plugs	181	92	51
Thermostatic Air Cleaner	236	8	3
TAMPERING			
Catalytic Converter	170	24	14
Fill Pipe Restrictor	182	19	10
Air Injection System	89	8	9
Unleaded Fuel Only	185	17*	9
EGR Valve	206	8	4
Evaporative Canister	210	3	1
PCV Valve	230	2	1

* Misfuelled Vehicles

Although this will not necessarily result in increased emissions - depending on the final setting of the idle mixture screws - the mixture setting will have been made richer in most cases to allow for smoother engine idle, thereby resulting in higher CO emissions.

As shown in Table 5, the most frequent types of tampering involved the removal or disablement of catalytic converters (14%), tampering with the fill pipe restrictor (10%), use of leaded gasoline in vehicles designed for unleaded fuel only (i.e. misfuelling) (9%), and tampering with the air injection system (9%). The tampering rates for most categories, however, could be higher than indicated, since function testing of components was not possible during most inspections because of time and equipment constraints, and a lack of specific technical information on the individual manufacturer's emission control systems.

The effects of tampering and arguable tampering on tailpipe emissions were determined for this survey. The idle and 2500 rpm concentrations of CO and HC from non-tampered vehicles were compared with those from both tampered and arguably tampered vehicles for 1975 and newer vehicles (Table 6). As one would expect, the emissions were lowest in all cases from non-tampered vehicles and highest from tampered ones. The most notable increase in emission concentrations was the more than five-fold increase in CO at idle, between non-tampered and arguably tampered

TABLE 6

COMPARISON OF TAILPIPE CONCENTRATIONS OF CO AND HC IN NON-TAMPERED, ARGUABLY TAMPERED AND TAMPERED VEHICLES 1975 - 1987 MODEL YEARS

CATEGORY	NO. OF VEHICLES	AVE. CO CONCENTRATION (%)		AVE. HC CONCENTRATION (ppm)	
		idle	2500 rpm	idle	2500 rpm
Non-Tampered	125	0.45	0.49	142	78
Arguably Tampered	62	2.37	0.72	307	116
Tampered	44	2.48	1.19	384	176

vehicles, reflecting the fact that the idle mixture had likely been made richer in most of the arguably tampered vehicles. Additional emission increases were noted between arguably tampered and tampered vehicles, since many of the latter showed evidence of multiple tampering with emission control systems in addition to carburetor adjustment changes.

5.3 Comparison of Brandon Results with Other Surveys

5.3.1 Tailpipe Emissions

In comparing the 1987 Brandon data with the 1986 Winnipeg data, the percentage of vehicles meeting the suggested idle and 2500 rpm limits for CO was higher in Brandon, but for HC emissions, was approximately the same as for Winnipeg (Table 7).

Average tailpipe concentrations of CO and HC were lower in all cases for the Brandon vehicles (Table 7). This is attributed to the higher percentage of new vehicles tested in Brandon than in Winnipeg. In Brandon, 47% of the vehicles, compared to 34% in Winnipeg, were five model years old or less.

The data in Table 7 show the apparent trend towards lower average CO and HC concentrations since 1979. This trend is expected to continue, as the older vehicle fleet is replaced with new vehicles having fuel injection and the more sophisticated

TABLE 7

COMPARISON OF MANITOBA TEST CLINIC RESULTS

	1987 BRANDON	1986 WPG	1983 WPG	1979 WPG
% of Vehicles Within Test Limits				
- CO @ idle	73	64	N/A	N/A
- CO @ 2500 rpm	88	78	N/A	N/A
- HC @ idle	84	86	N/A	N/A
- HC @ 2500 rpm	95	97	N/A	N/A
Ave. CO (%)				
- @ idle	1.58	2.1	3.05	2.9
- @ 2500 rpm	0.73	1.15	N/A	0.93
Ave. HC (ppm)				
- @ idle	246	315	N/A	378
- @ 2500 rpm	124	157	N/A	218

N/A - not available

emission control systems required to meet the new emission standards for 1988 and newer vehicles. Lower tailpipe concentrations of CO and HC, however, do not necessarily equate with lower emission rates (as grams per kilometer) as regulated in the Motor Vehicle Safety Act Regulations for new motor vehicles. Comparisons of idle emission tests with the more rigorous Federal Test Procedure (FTP) used for new vehicle testing and certification in the US and Canada have shown poor correlation, because of differences in the duration of the tests, test cycles followed, and other test conditions such as engine load (Duleep et al., 1985; Haskew et al., 1987). Tailpipe emission testing, however, can be useful in detecting vehicles with excessive emissions.

5.3.2 Tampering

The types and frequency of tampering observed were generally lower in the 1987 Brandon clinic than the 1986 Winnipeg clinic (Table 8). This can likely be attributed to the larger percentage of newer vehicles tested in Brandon, and the fact that owners tend to tamper less with emission control components on newer vehicles, particularly while still under warranty.

Table 8 also compares the results of the Winnipeg and Brandon surveys with those from the 1985 U.S. EPA tampering survey. The EPA survey involved 6,586 vehicles in 15 cities, and covered

TABLE 8

COMPARISON OF TAMPERING RATES

	1987 BRANDON	1986 WPG	1983 WPG	1985 US EPA
		(% of Vehicles)		
ARGUABLE TAMPERING				
Sealed plugs/ Limiter caps	51	33	28	42
Thermostatic Air Cleaner	3	4	N/A	16
TAMPERING				
Catalytic Converter	14	15	2*	5
Filler Neck Restrictor	10	N/A	N/A	7
Air Injection System	9	18	N/A	7
Unleaded Fuel Only	9	N/A	N/A	9
EGR System	4	3	19	7
Evap. Canister	1	5	N/A	4
PCV System	1	2	N/A	5

* Based on intermittent checks only

areas with and without compulsory inspection/maintenance (I/M) programs (U.S. EPA, 1986). The EPA tampering rates are shown primarily for interest, since a comparison of results with those obtained in the 1987 and past Manitoba surveys may not be valid because of differences in data collection methods. Some general comments may be made, however. The lower frequency of tampering with catalytic converters in the U.S. may be as a result of stronger legislation against tampering. In the EPA survey, the tampering rate in areas without compulsory I/M programs showed that 8% of the vehicles had had catalytic converters tampered with, as compared with a 5% overall rate. Equal pricing of leaded and unleaded fuel in the U.S. may also make it less attractive to tamper with catalytic converters.

The rate of arguable tampering with respect to thermostatic air cleaners (heated air intake system) was significantly higher in the EPA than the Manitoba surveys. This may be due to the warmer winter climates found in the U.S. survey areas, where the proper operation of this system would not be as critical during a vehicle's warm-up period as in colder climates.

It is interesting to note that tampering was quite prevalent in all areas surveyed by the EPA, even in those areas with legislation prohibiting tampering or having compulsory I/M programs.

6.0 Conclusions

On the basis of emission testing of 244 vehicles in Brandon, it was found that 73% and 88% of the vehicles met the Environment Canada suggested emission test limits for carbon monoxide at idle and 2500 rpm respectively. In terms of hydrocarbon emissions, 84% and 95% met the limits at idle and 2500 rpm respectively. There was considerable variability observed in average emissions from one model year to the next.

Tampering with emission control systems generally increased with vehicle age. The most prevalent types of tampering, in order of frequency of occurrence, were: catalytic converter removal, fill pipe restrictor removal, misfuelling with leaded gas and tampering with the air injection system. The most common form of arguable tampering involved the removal of carburetor seals and plugs. Tampering and arguable tampering resulted in significantly higher concentrations of CO and HC in vehicle exhaust.

Average emission concentrations of CO and HC were lower in Brandon than in Winnipeg in 1986, as was the tampering rate. These differences were attributed primarily to the higher percentage of newer vehicles surveyed in Brandon.

It is expected that lower emission levels and lower rates of

tampering will continue to be seen in the in-use vehicle population, as the current vehicle fleet is replaced with newer vehicles having more sophisticated emission control systems and improved engine design. Motorists in general appear to be more knowledgeable about the importance of emission control systems, and their role in reducing the environmental impact of automobile emissions.

7.0 References

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8.0 Acknowledgements

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The author would like to thank the City of Brandon for the loan of barricades and traffic cones for the test clinic.

APPENDIX A

BRANDON SUN ARTICLE

BRANDON SUN - June 24/87

Sun photo by Dirk Abersc

CAR CHECK: Terry Youmans of Environment Canada checks a car at the Canada Vehicle Emission Test Clinic.

Crew tests cars in attempt to clear the air

by JEFFREY SLUSKY
Sun Staff

More than 60 Brandon car wners took advantage of a free linic at the Keystone Centre uesday to see if their vehicles re polluting the air.

Until Saturday, Environment anada will be testing automobile exhaust systems in an effort to "help fight motorosis."

According to Environment anada, automobiles account for bout 60 per cent of the total lead missions in Canada.

All cars built after 1974 can se unleaded fuel, but because eaded is cheaper, many motorsts have had their engines modified, enabling them to use the less xpensive fuel.

Most cars have factory inalled pollution control devices, ut have been disconnected or renoved in an attempt to increase as mileage.

"We're basically concerned with misfueling (using leaded gas in a car designed to run on unleaded) and tampering with the pollution control devices," said Doug Cope, an engineer with Environment Canada.

"There is a mistaken impression that a car will get better mileage without the devices," he said. "A car's mileage depends on regular maintenance and proper tune-ups."

Mr. Cope said he's expecting to see "300 plus" cars during the five-day checkup.

Although a few of the cars checked on Tuesday had disconnected pollution control devices, Mr. Cope said most "are in pretty good shape."

He said the only provinces that have anti-tampering legislation are Ontario and Quebec, but because a lot of people from Manitoba are heading east for their summer vacations, they don't want to take a chance on getting stopped by the police.

Beatrice Enders brought her 1987 model station wagon to the clinic to be tested.

"I'm not really concerned, because the car seems to be running fine," she said. "But the clinic is free, so I figured I would have it tested anyway."

Mrs. Enders said she vacationed in Phoenix, Ariz., over the winter, and pollution control clinics were offered in that city.

"They are really concerned about pollution there," she said. "The lineups to have cars checked were very long."

Christena Carlson said she brought her 1981 model van to the clinic "because I'd like to know what it's doing."

Mrs. Carlson said she is concerned about air pollution resulting from car exhaust.

"I might as well take advantage of the service — it's free," she said.

Owners of cars and trucks needing repairs are being referred to auto service centres.

"We're not really licensed mechanics," said Terry Youmans, a environmental officer with Environment Canada.

And unlike Manitoba Vehicle Safety Inspections, if a problem is found, the car owner isn't obligated to have the car repaired.

However, Mr. Youmans said because people are taking the time to have their cars checked, it's an indication that they are concerned about general maintenance.

Mr. Cope said Brandon is the only city in which the federal government is offering the clinics this summer because of funding cutbacks.

The clinic is open until Saturday from 9:30 a.m. to 4 p.m. in the Keystone's parking lot.

APPENDIX B

SURVEY FORM

NUMBER: _____ DATE: _____ LOCATION: _____ INSPECTOR: _____

1. _____ MAKE
2. _____ MODEL
3. _____ MODEL YEAR
4. _____ LICENCE PLATE (PROVINCE)
5. _____ VEHICLE TYPE (C = Car, T = Truck)
6. GVWR: _____ lbs _____ Kgs
7. _____ ODOMETER - THOU._KM_Mi
8. _____ DASH LABEL (Ø,N,Y,?)
9. _____ FUEL USED - MOTORIST (L = Leaded, U = Unleaded, NU = Combination, A = Alcohol blend, AN, AU = Combos, C = CNG, D = Diesel, M = Neat Methanol, P = Propane, Z)
10. _____ DISPLACEMENT ____ LITRES ____CI
11. ____ NUMBER CYLINDERS (3,4,5,6,8,Z)
12. _____ VIN (Record from left, use door post label)
13. _____ ENGINE FAMILY
14. _____ TRANSMISSION (M3, M4, M5, M8, A)
15. ____ U.S.A. SPECIFICATION LABEL (N,Y,?)
16. _____ A LABEL STATES CATALYST (NL = no label, Y = label indicates CAT, N = label does not list cat, 9 = label obscured)
17. ____ CAT CONDITION-INSPECTION (Ø,Y,4,5,6,7,9,?)
18. _____ CARB BARRELS (Ø,1,2,3,4,?)
19. _____ CARB HAS SEALS OR CAPS (C = limiter caps, S = seals, ?)
20. _____ SEALS OR CAPS CONDITION (Ø,N,Y,4,7,9,?)
21. _____ FUEL INJECTION (N, MP = multi-port, TB = throttle body, Y, Z)
22. _____ TURBO (Ø,N,Y,?,B,D)
23. ___ EGR VALVE OR SENSOR (Ø,Y,1,3,4,5,7,9,?)
24. ___ CLOSED LOOP COMPUTER FEED BACK (N,Y,9 = motorist reports problems)
25. ___ O_2 SENSOR (Ø,Y,2,4,7,?)
26. ___ ENGINE CHECK LIGHT (N,Y,L - ON, ?)
27. ____ PCV (Y,1,3,5,7,9)
28. ____ THERMOSTATIC AIR CLEANER (Ø,Y,1,3,4,5,6,7,9,B,I = inverted, J = Stovepipe disconnected)
29. ____ EVAP CANNISTER (Ø,Y,3,4,5,7,9,?)
30. ____ AIR PUMP (Ø,Y,4,5,7,9,?)
31. ____ AIR PUMP BELT (Ø,Y,7,8,9)
32. ____ AIR INJECTION, ASPIRATION, PULSE AIR SYSTEM (Ø,Y,4,7,9,?)

IDLE EXHAUST EMISSIONS

33. LOW _____ RPM HIGH _____ RPM
34. _____ HC (PPM) _____
35. ____.____ CO (%) ____.____
36. _____ EXHAUST SYSTEM INTEGRITY (Y, L = leaks)
37. _____ FUEL CAP (Y,7)
38. _____ FUEL CAP SEAL (Y,7,?)
39. _____ FUEL INLET RESTRICTOR (Ø,Y,1,4,7,?)
40. _____ TANK FUEL LABEL (ØY,7,9 = painted over)
41. _____ DESIGNATED FUEL TYPE (L = none = leaded, U = Unleaded, D = Diesel, Z = other)
42. _____ FUEL SAMPLE TAKEN (N,Y)
43. _____ PLUMBTESMO TEST (P = Positive, N = Negative)
44. COMMENTS

_____

CODES

Ø	=	Not originally equipped.
N	=	No or None or Negative.
Y	=	Yes or Component Present.
1	=	Correct Function Verified.
2	=	Electrically disconnected.
3	=	Vacuum disconnect.
4	=	Mechanical disconnect.
5	=	Incorrectly routed hose.
6	=	Modification.
7	=	Removed or missing item.
8	=	Misadjusted.
9	=	Malfunction or Deterioration.
?	=	Cannot determine.
Z	=	Other.

FIGURE B.1 SURVEY FORM NO. 1 - COMBINED SINGLE SHEET

APPENDIX C

ENVIRONMENT CANADA SUGGESTED EMISSION TEST LIMITS

SUGGESTED EXHAUST EMISSIONS TEST LIMITS**

	2 500 RPM				IDLE			
	6 & 8 Cylinder		4 Cylinder		6 & 8 Cylinder		4 Cylinder	
Vehicle Age	CO %	HC ppm	CO %	HC ppm	CO %	HC ppm	CO %	HC ppm
0-1***	1.0	200	1.5	200	1.5*	300	2.5*	300
1	1.1	230	1.6	230	1.6	330	2.6	330
2	1.2	260	1.7	260	1.7	360	2.7	360
3	1.3	290	1.8	290	1.8	390	2.8	390
4	1.4	320	1.9	320	1.9	420	2.9	420
5	1.5	350	2.0	350	2.0	450	3.0	450
6	1.6	380	2.1	380	2.1	480	3.1	480
7	1.7	410	2.2	410	2.2	510	3.2	510
8	1.8	440	2.3	440	2.3	540	3.3	540
9	1.9	470	2.4	470	2.4	570	3.4	570
etc.								

* The existing MVSA new vehicle emission standards for the idle test.
** To be used if the manufacturer's specifications are not available.
*** Present model year.

(from Vehicle Emissions and Pollution Control Equipment Inspection Clinic, Information Package, EPS Draft Report, May 5, 1986)